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MARCH, 1939 VOLUME XVI, NO. 3

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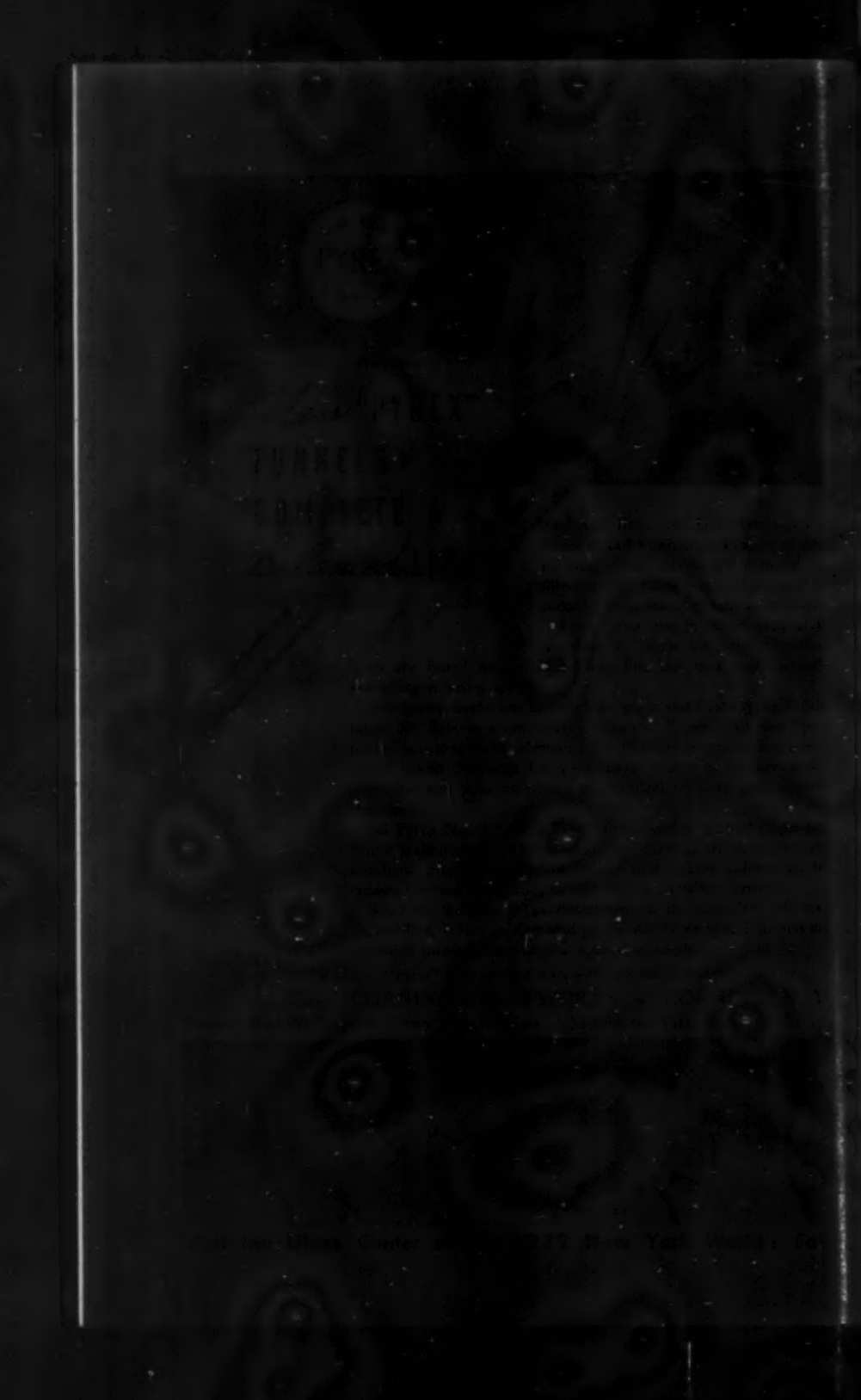
CHEMICAL EDUCATION IN A DEMOCRACY

THE CHEMIST AND THE GOVERNMENT SERVICE

POSTAGE STAMPS AS A CHEMICAL AID



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The Composition of the Chemist

By **Henry G. Knight, F.A.I.C.**

An address by the Chief of the Bureau of Chemistry and Soils, U. S. Department of Agriculture, before a meeting of the Washington Chapter of The American Institute of Chemists at Washington, D. C., Friday evening, January 27, 1939.

IF WE could psycho-analyze a composite of my audience we might have a good answer to the question of what is the modern chemist made. But probably that would be as difficult as the job the old alchemists laid out for themselves — making gold from baser metal. They set out to crack Nature's strong box by direct action and failed; just how far they missed or how near they came to a possibility none of them lived to know. With all their imaginings perhaps they lacked imagination, and most certainly they lacked knowledge on which to feed it. But the vapors they produced watered the growth that has become the many-branched and sometimes awesome modern chemistry.

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We are still working on Nature's strong box, and now we know it contains innumerable compartments, sub-compartments, closets, shelves, secret drawers, bottles, vials; balms that soothe, bombs that kill, honey and sparkling jewels. We have found that gold is not necessarily real wealth; that the chemist and his co-workers who face the unknown with him can find and make things of much more importance to cold, hungry, uncomfortable men. With the record as it stands today, the chemist can take pride in his professional ancestry while he offers hope and many problems to posterity.

No one who reacts to what is going on in the agricultural, industrial and social retorts today would be likely to deny that one thing surely needed in the composition of the chemist is imagination. It is one of these basic constituents having as much importance in extending science or technical accomplishment as calcium has in the growth of a racehorse.

How does a man come by this so useful quality? Perhaps he must be born with the seed of it in his system. We do know that when it sprouts it will not take on lusty growth without the nutriment provided by a thorough grounding in the fundamental sciences and a high degree of familiarity with the principles that support his particular science. The desire and pressure for early specialization has led many men to neglect this groundwork. I believe there are many colleges now that feel the need for more thorough preparation, which would mean postponing specialization until later. I have in mind successful chemists who did not really find themselves for a number of years, and did so only as the result of varied experience. Unfortunately many of them never do. A man can not put every possibility into the test tube of his experience, but a great deal can be done. If more employers of chemists (research laboratories as well as commercial concerns) recognized that putting their more-or-less rough human material through the tumbler of changing experience would bring out smoother and better fitting parts for the organization, more men would realize their potentialities. I suspect that research laboratories fail as often in this respect, and perhaps oftener, than do those whose methods are sharpened by the need for direct profit.

It seems reasonable to suppose that more articles and booklets of the purely road-marking type should be written to help the chemist know where he is, where he is headed, where he might go, and where the side roads come from or lead to. They might teach him something about detours and openings for good views of the future.

With a firm foundation established and means available to see the network of interrelations with other sciences, agriculture and industries, the danger that the chemist may find himself out on a limb is greatly

reduced. Nature uses all things together, so it does not appear the part of wisdom to split up too much—at least not too early. The point is always the last part of the pyramid to be put on.

This good foundation, this groundwork that fertilizes the imagination, has another great value in addition to the direct usefulness of the information. It enables the possessor to distinguish between what is fact and what is faith or supposition. Imagination builds theories, a sort of mental pioneering that scouts out the country, making way for law and order and development. This sort of faith we know is an essential of science, but no man should ever let familiarity lead him to forget to distinguish between what he knows to be true and what is merely a convenience because for the time it works as if it were true. We use many such conveniences, for example our present theories on the constitution of matter. The older ones were also in this class, which an old chemist friend of mine speaks of, and not without respect, as the fairy tales of science. Above all, the chemist must be a realist — even in making use of fairy tales.

It would be impossible for me to give much of an idea of all the various developments in the world that are important to the chemist or that demand the assistance of chemistry. My field is agricultural chemistry, technology and engineering. There are enough tough problems of many kinds here to provide good mental chewing for a long time.

The provision by the Congress of funds for four regional laboratories in which to carry on studies with a view to increasing industrial uses of farm products is an indication of the growing recognition of opportunities in this field. Only recently the Civil Service Commission announced examinations to fill twenty-five positions in these laboratories which require men capable of leading various research projects dealing with such farm products, among others, as cotton, wheat, sweet potatoes, peanuts, potatoes, apples and other fruits, oil seeds, and sugar crops. It is expected that ultimately these laboratories will employ a total of close to one thousand scientists and technicians, a good share of them chemists.

In agriculture, it seems to me, there is more interweaving of threads spun by various specialists than there is in industry. The long list of crops, animals, products, and by-products, on the face of it, would make this appear a reasonable conclusion. Here, in addition to chemical constituents, investigators are dealing with bacteria, molds, enzymes, vitamins, ferments, calories, economics, statistics, and engineering problems in production, marketing and processing.

Plainly it is up to the chemist interested in his own composition to

have some acquaintance with this Joseph-coat fabric. It is pretty loosely woven, there are places where threads have been dropped, tears and gaps, but it is better this way than when each group had its own ball of yarn.

Now that we are coming to make use of these relationships so that any one thread strengthens the others, we are finding that many of the greatest opportunities lie in efforts to fill in the open spaces. A good example with which to illustrate this is the study of problems in the storage of various products — wheat, corn, potatoes, fruit, nuts, meat, dairy products, even flowers. Storage in buildings and transit storage in railroad cars and in trucks have become one of the most conspicuous features of present-day life. The factors in it are diverse. We must try to know how all of them affect each product and how to control them. In the list we can include temperature, humidity, time, chemical composition of the product, enzymes, bacteria, molds, insect pests, the composition of the container, and perhaps other things I can't recall. A lot of work has been done on storage and much is being done. More must be done. And to do it well, without waste of time and without getting the threads tangled, the chemists, engineers, plant specialists, biologists, entomologists, bacteriologists, physicists ought to have more than a kicking acquaintance with each other and with the producers, movers, improvers, processors and marketers of the products.

If a chemist in addition to being a specialist also becomes somewhat of a generalist, his outlook to the future is not through a keyhole but rather from the roof. Broad fields are open to him. He can go back to the home nest, but the roof-top view goes with him. If he has certain qualities, he may find now before him opportunities for administrative work. Industry and research and business feel a growing need for such men. They are plastic pegs that can adapt themselves to many kinds of holes.

Louis Pasteur was a plastic peg. He was a chemist, scoffed at, kidded and maligned by medicine men who hadn't yet learned to keep their hands clean. The doctors thought he should keep his nose in the wine vats and out of their profession. Yet today the whole world is still thrilled by his story and probably thinks of him more as a doctor than as a chemist. The veterinarians might well claim him as their own. Hydrophobia, anthrax, childbed fever, and the problems of the wine makers were all grist to his mill.

Pasteur wrote in French. Liebig, who died about the time Pasteur was in his prime, wrote his chemistry in German. Surgeon Lister, who did not run with the scoffers, was an Englishman. Languages are important hurdles for the chemist to overcome, and I include a man's native

tongue. To be in touch with what the world has done and, particularly, with what it is doing at the moment, before adequate translations appear, the chemist must have more than his own language. In addition to English he surely needs French and German. There is much of great value in other languages — Russian, for instance. But we cannot multiply the tools too much without hiring a caddy.

Knowing two foreign languages, however, can never make up for a lack of facility with English, the everyday tool for us here. It is a matter for frequent comment that so many of the reports of scientists, chemists included, of course, are made more difficult of understanding because with all their knowledge of the elements of this and that they have neglected the elements of English. Students in science courses have had a reputation for approaching English classes with lips compressed in a manner learned in their castor oil period. I believe that attitude is changing these days, partly because science in the past twenty years has become a matter of everyday discussion in the newspapers and popular periodicals. It should change more. Good English is the medium in which the chemist can crystallize his conclusions.

When I talk about the importance of a thorough acquaintance with this language tool, I do not flatter myself that I or my generation have made the discovery. When chemistry was very young, Lavoisier bore down on the point. He said, "However certain the facts of any science, however just the ideas derived from these facts, we can only communicate false or imperfect impressions to others if we want words by which these may be properly expressed."

With all this, there is still more that belongs in the formula for a good chemist. He may have imagination and the common and rarer elements in proper balance to stimulate it; he may have experience and the means of gathering the experience of others; he may be industrious; and he may report his results with Biblical simplicity and force — but if he has not integrity of purpose the reaction will produce only water, and not heavy water either.

If so much is to be expected of the individual chemist, he ought to expect something, too. There are thousands of chemists and hyphenated chemists in this country, drawn into the work by rapidly changing agriculture and industry by progress in the profession, by a changing way of life that has given this country more modern conveniences and a better food ration than most other countries enjoy. Yet there are other thousands of chemists, many of them well equipped who are out of a job or are hitch-hiking along on skimpy incomes. THE AMERICAN

INSTITUTE OF CHEMISTS has exerted itself to try to solve this problem, one that is faced by men in other professions as well. It is a responsibility of all of us to help devise more ways and means. But there is probably no panacea, no universal solvent for it.

Nevertheless, there are prospects and the brightest prospect that I see for chemists is broadened research work. The present trend in the Department of Agriculture is one example of this. Research is slow and for the future, but research in many directions is sure. Each successful venture into the unknown opens up new fields for development and new prospects for investigation. The farther we stretch the circle of our knowledge, as was pointed out by thinkers long ago, the more contacts we have with the unknown and that is one of the most hopeful things in a world that wants to be busy.

But since such growth is slow, for the present mutual support is the urgent need. Educated and well-trained men should be effective beyond the usual in such efforts. In the December issue of a monthly magazine of wide circulation, I read of a good example of this kind of coöperation among a group of former business executives in New England, all of them over forty. The members of this "Forty Plus Club" make a large number of calls on employers each week, but they do not try to sell themselves. All their energy and resourcefulness is used to get a job for some other fellow who is known to have qualifications that fit him for the place. This go-get-it-back group is now "recognized by civic organizations and business groups as an agency of high social and economic significance".

Such efforts as this are an inspiration to us. In our field there should be many willing contact men who could act as catalyzers to set up reactions between jobs and men who have the right composition to fit them.

It would be wrong for me to leave the impression that I think I have devised a yardstick that will make it easy to put each man in the right yard. What I have said has been said in all humility. I do believe that the several things I have emphasized are highly desirable, but there are chemists practicing their profession today who are proving that a man can sometimes go a long way on a wooden leg — if he keeps it well oiled. On the other hand, there may be additional desirable components in the chemist that other men would like to see in the list. It pleases me to lay stress on imagination and realism, on broad fundamental education, varied experience, foreign languages, succinct English, a good code of ethics. It wouldn't please me to drop any of them. There they are, you may add your own seasoning.

Chemical Education in a Democracy

By **Ross A. Baker, F.A.I.C.**

Professor of Chemistry, College of the City of New York

An Address Presented Before The American Institute on the Occasion of the Presentation of a Fellowship in The American Institute to Dr. Baker at its Medal and Fellowship Awards Dinner held in New York, N. Y. on February 2, 1939.

LIKE any other exact science, chemistry is built upon an interrelated group of tested and testable facts. (Some of my students would probably like to add "detested".) But let me emphasize the word "testable". This means that the facts of chemistry are verifiable, or, as our beloved Dr. Whitney used to say, "They are better than U. S. gold notes since they are demonstrable on demand".

The sector of knowledge occupied by chemistry comprises the facts and laws which deal with the properties of substances and the changes which they undergo. Out of half a dozen kinds of primordial particles Nature seems to have fashioned about one hundred elementary substances, which are the conventional building blocks not only of the chemist's domain but of the world as we know it. From these elements, Nature herself has formed about one hundred thousand compound substances, while the chemist, taking the dare from Nature, has synthesized over three hundred thousand additional substances. These daring synthetics include substances with which you are all familiar, such as cellophane, aniline dyes, and nitroglycerine. We are confident that additional hundreds of thousands are lurking in research laboratories scattered all over the world. It is appalling when we think that any one of these to-be-discovered synthetics is potentially the basis of a new industry, a new war or even a new civilization.

It is easy to sympathize with those who are frantically calling for a moratorium on scientific research. But a moratorium of this kind would be absolutely impossible, even in a world composed entirely of dictatorships in complete agreement with each other, for man's curiosity is insatiable, his imagination is irrepressible, and he feels that he is literally surrounded by undiscovered facts. The intense nationalism which is activating the world today only speeds the processes of discovery and invention.

Depressions and wars are sometimes attributed to science as though it were a personality or a philosophy or a religion. But science is merely

a body of knowledge which cannot be given a prison sentence for the malevolent uses to which it is put. For example, chemistry is no more responsible for the use of poison gas in warfare than is an apple tree for a boy's stomach-ache. Our present depressing pains in this country are due to social indigestion and not to high science blood pressure.

Although science cannot be held responsible for its social misuses, it is increasingly evident that scientists, individually and collectively, must take a vigorous part in social planning. They are not in any way exempt from social and political responsibility. To completely adapt science to the life of any community we should solicit the coöperation of five agencies: (1) the exact scientist, (2) the social scientist, (3) the teacher, (4) the administrator and (5) the consumer. And the modern world should safeguard the health and education of these Social Quintuplets quite as zealously as Dr. Dafoe cares for his "Dionettes".

The greatest contributions of chemistry to society have been its laws and generalizations, which have literally opened the doors to discovery and invention. These laws are not historical gossip; they can be stated in the future tense, and when so stated they become the most powerful tools ever forged by man. Each one of us should have at least a consumer's interest in this all-pervading and rapidly expanding science, which belongs to us all and not just to chemists or to totalitarian governments.

You should realize that each of you is a chemical executive. You are the appointed manager of a chemical organization—your body—which is operating rather inefficiently in active competition with death. You inherited this plan and, unfortunately, you can do pretty much as you please with it. But how much do you really know about it? This is the first challenge that chemistry hurls at every individual. So far chemists have discovered only a fraction of what there is to be known about human chemistry; we are confident however that chemistry is at the base of every process of growth and metabolism; of every nervous impulse and muscular contraction and of the effect of every drug and medicine.

I believe that a study of the fundamental facts and laws of chemistry should be required of every citizen. I don't mean that he should be trained for the profession of chemistry or that he should even be tempted in that direction and I am not concerned over whether or not the chemical part of this elementary training is called chemistry or something else. What I am interested in is the subsequent performance of voting citizens and consumers in a world which is so largely chemical.

There has been a definite breakdown in the arbitrary walls which formerly preserved in water-tight compartments the subjects of chemistry, physics, and biology. Instructors in these sciences are experimenting with general science "trees", planted in the soil of the elementary school and nourished by the pupils' natural desire to create and experiment. The plan is to allow such a tree to grow steadily until it has reached the level of the senior high school, when specialized science can be grafted on to it.

I believe that the present swing toward generalized science in college is only temporary. As soon as the high schools have perfected their general courses—and they have already made a very laudable start in New York—the colleges will wish to offer a new series of subject-centered courses in the various sciences to freshmen and sophomores, based definitely upon the high-school general course. Of course there will still be a place for Science Survey in college, but this will come more properly in the senior than in the freshman year.

I would enlarge the term chemical education to include every agency which "exposes" an individual to chemistry. Shows and exhibits, popular lectures and demonstrations, articles in magazines and daily press, science clubs, Boy Scout chemistry and chemistry play sets, are all truly formidable educational forces. I venture to say that chemistry appeals to more people each year through these extra-curricular channels than through all our formal courses put together. I am sorry to confess that much of our conventional teaching is a process of pouring educational water over the backs of classroom ducks—in the absence of wetting agents.

The widespread extra-curricular interest in chemistry is a challenge to every professional chemist to identify himself as a counselor in his community. We should normally expect him to be consulted by the school board in the selection of teachers and the equipment of laboratories. But he is also in position to advise boys who are intrigued by chemistry, most of whom should be frankly discouraged from entering the profession. He should accept calls to serve as club sponsor, Boy Scout committeeman, speaker before informal groups and interpreter of chemistry in the daily press. Any chemist who wishes to be of service but doesn't know just how to start would do well to consult the American Institute, which has accumulated a wealth of experience in its pioneering work of sponsoring junior science club activities throughout the nation.

Whether instruction in chemistry be formal or informal, the main

objective is the same. It is the training in the scientific method of thought and action. No amount of factual knowledge may be substituted for it. A laboratory is absolutely necessary for it. Here the student learns through self-reliant experiment instead of through hearsay evidence. Here he may modify his procedure, predict probable results and test his conclusions. The priceless ingredients of the experimental laboratory are: (1) Making and correcting original mistakes; (2) assuming complete responsibility for one's actions, and (3) working shoulder to shoulder with Nature.

The ideal arrangement in the laboratory would be to conduct lectures, recitations, and examinations right at the student's desk. But mass education makes necessary group treatment. And, unfortunately, during the depression, educationists who advocate substitutes for individual laboratory work have been received with great favor by school administrators who consider the saving of money to be their chief function. As a result, teachers of laboratory subjects have been placed on the defensive; they have been asked to economize on time and space, on materials and energy. They have been required to substitute demonstrations and group experiments for individual laboratory work. Much valuable ground has been lost.

The study of chemistry leads to specific goals which cannot be reached by the study of any other science. In the order of importance, these are: (1) The feel of matter—an appreciation of the individuality of every substance; (2) an awareness of imminent but controllable changes in the composition of substances; (3) a knowledge of the essential properties of commonplace materials sufficient to live with them in economic peace; (4) a knowledge of chemical laws and theories sufficient to assimilate chemical news in the daily press, and (5) an acquaintance with the technical literature sufficient to follow up items of interest.

During the past twenty years, a new kind of revolution has developed; we are in the midst of it now; it may be called the chemical revolution to distinguish it from the so-called industrial revolution, during which men were replaced by machines. The chemical revolution means that new materials, created in the laboratory, replace old raw materials, rendering not only machinery but also whole industries obsolete—and almost overnight.

It is a sad commentary on the chemical revolution that courses in chemical economics are conducted almost exclusively by colleges of

engineering and not by colleges of business. The fundamental importance of chemistry has been clearly recognized by a number of professions. The honor roll includes engineering, medicine, forestry, agriculture and home economics, all of which require chemistry in their curricula. Meanwhile most colleges of law and business have kept their heads buried in the sand, persistently ignoring the social, economic and political impacts of chemistry.

The Young Chemist and the Government Service

By **Louis Marshall**

The third of a series of articles dealing with the opportunities for the chemist in the Government Service.

The Department of Interior — Geological Survey

THE Geological Survey of the Department of Interior is devoted to the gigantic task of studying the natural structure of all regions of the United States and its possessions, and of preparing accurate maps thereof. The Survey is a very able organization of geologists, paleontologists, geographers, physicists, engineers, and chemists. Its work is divided among various divisions, the division of chemistry and physics being charged with the responsibility of conducting very difficult analyses and research work in inorganic chemistry, and its achievements in this field have won universal recognition. Its analyses of rocks of various kinds stand as models of accuracy and any budding analytical chemist who wants to learn what good work really is, can do well to study the analyses carried out and published by the United States Geological Survey.

The organization has enjoyed the services of at least two men, William F. Hillebrand and Frank W. Clarke who will always stand high in the history of American Chemistry.

The results of the analyses upon rocks are published in certain bulletins of the Geological Survey. Bulletin 878, for example, tabulates the analyses made during the period 1914 to 1936. In the period covered by bulletin 878, 1533 samples of rock of widely varying kinds, taken from all regions of the country, were completely analyzed. In addition to this work, a very large number of partial and routine analyses of rocks and minerals were made. The data thus obtained is of the

greatest value to the geologist seeking an explanation of the phenomena involved in the formation and metamorphosis of the earth's crust.

Many of the difficult problems involved in the separation and quantitative determination of the constituents of so complex a mixture as a rock were investigated and solved by its chemists. For example: It was early shown that the combined percentages of titanic and phosphoric oxides in rocks of the earth's crust averaged eight tenths of a per cent, and when the determination of these constituents was neglected, the error fell on the aluminum. When the latter was used to calculate the percentage of feldspar in rocks, large errors were often introduced. Many methods of analysis devised by chemists throughout the world were tested and evaluated by the scientists of the Geological Survey.

The work of the Survey was instrumental in showing that titanium, at one time held to be rare, is one of the most universally distributed of the elements, and is about tenth in actual abundance in the explored crust of the earth. The element is present, at least to some extent, in all igneous, metamorphic, or sedimentary rock of a siliceous character. The recognition of this fact has been made possible by its characteristic behavior toward hydrogen peroxide. In a slightly acid solution of titanium sulphate, the addition of hydrogen peroxide produces a coloration which is orange-red or yellow depending upon the concentration of the salt, and this exceedingly delicate reaction is especially suited for the detection of titanium in rocks. It has been made the basis of a quantitative method for the determination of titanium. The color of a known volume of solution is compared with that of a standard solution of titanic sulphate, both solutions having been fully oxidized by hydrogen peroxide. In studying this method, Hillebrand showed that mere traces of hydrofluoric acid or a fluoride interfered with its accuracy by partly bleaching the yellow color produced. The necessity for care in the selection of the reagents used was thus indicated.

Zirconium was likewise found to be more widely distributed in silicate rocks than had been previously suspected. However it is much less common than titanium, comprising usually five hundreths of a per cent or less of the entire rock. Lithium was found to be one of the most universally distributed of the elements, but seldom to an extent greater than a spectroscopic trace. Bulletin 878 of the Geological Survey contains a highly informative table giving the relative abundance both by weight and by atoms, of all known elements. The table shows,

for example, that hydrogen constitutes one per cent by weight of all the elements. Because of its relatively low atomic weight, however, its relative abundance with respect to the total number of atoms of all elements is seventeen and twenty-five hundredths per cent. Zinc comprises two hundredths of a per cent by weight of all elements, and five thousandths of a per cent with regard to its relative abundance among all atoms. The table contains similar figures for all the known elements.

One of the recent lines of investigation of the Survey was carried out in connection with the search which the Government made for potash. This project, which occupied a great deal of time particularly in the period from 1926 to 1931, involved a large number of determinations of potash in drill cores and cuttings taken from different regions of the country. The investigation was undertaken for the purpose of discovering new sources of this important fertilizer material.

Another important function of the chemical laboratories is the analysis of the surface and underground waters of the United States. These analyses are of value in determining the suitability of waters for different industrial purposes, and for studying the regions through which the water flows, and for many other reasons. As an illustration, it may be pointed out that the waters of rivers and streams which contain sufficient quantities of alkali carbonates to precipitate calcium and magnesium carbonates will cause no difficulties from hardness nor will they produce the troublesome hard scale in boilers. Similarly, surface waters containing traces of free alkali have been found to be generally associated with lakes receiving waters from the massive rocks of mountains.

Standard methods have been worked out for the determination of iron, aluminum, calcium, magnesium, sodium, potassium, alkalinity, acidity, chlorides, nitrates, and sulphates. These analyses provide a means of determining the potability of different waters, or their suitability for different industrial purposes. They may be valuable in gaining knowledge about regions through which the waters pass. The data which the Survey has collected regarding the supplies of water, both on the surface and in the ground, the chemical quality, availability, and fluctuations with variations in rainfall, have been found essential to such matters as domestic water supply, irrigation, flood protection, control of pollution, and water power development.

The determination of the age of rocks on the basis of the lead-uranium ratio, one of the outstanding problems of geochemistry, has received the attention of chemists of the Survey. The method rests

upon the known fact that, in the complex disintegration process undergone by uranium, lead is the end product. One contribution to the subject appeared in the *Journal* of the Washington Academy of Science, volume 21, page 409. The subject material was kolm, a material resembling oil shale, and occurring in certain limestone and alum shale quarries in Sweden. This material was found by very painstaking and difficult analytical work to have two hundred and sixty-four ten thousandths of a per cent of lead, and four hundred and thirty-two thousandths of a per cent of uranium. The data thus obtained is sufficient to calculate the age of the substance using the following formula:

$$\text{Age} = \frac{\log (U + 1.156\ Pb) - \text{Log } U}{6.5 \times 10^{-5}} \times 1 \text{ Million Years}$$

which comes out to be four and fifty-eight million years, placing the origin of the material in the pre-Cambrian era.

The publications reporting the researches of chemists of the Geological Survey have appeared in a large number of outside periodicals. The *Journal of the American Chemical Society, American Journal of Science, American Mineralogist,* and the *Journal of the Washington Academy of Sciences,* all contain papers by Survey chemists. In addition, there are a few series of Government publications which are of interest. The *Monographs* of the Geological Survey are rather complete discussions of geological topics. Number seven in this series deals with the silver-lead deposits of Eureka, Nevada. The *Professional Papers* series are similar to the *Monographs,* dealing as they do with a variety of topics investigated by specialists of the Survey. For example, number 99 contains the chemical analyses of igneous rocks published from 1884 to 1913, with a critical discussion of the character and use of analyses. Number 124 deals with the inorganic constituents of marine invertebrates. Naturally, most of the papers in this, as well as the other series, deal with geological matters like glaciation in Alaska, physiography and geology of eastern Montana and adjacent areas, the pre-Cambrian rocks of the Lake Superior region, the Gold Hill mining district of Utah, and so on.

The maps which are produced and sold by the Geological Survey appear in series like the Folios of the Geologic Atlas of the United States. These excellent maps cover the entire nation, and an index circular showing the published maps of areas in any state may be had free upon application to the Director, United States Geological Survey, Washington, D. C.

The Bulletins of the Survey contain the papers on economic geology,

and the mineral resources of the nation. Some of the bulletins are of interest to chemists, as for example, number 207 dealing with the action of ammonium chloride upon silicate and carbonate rocks; number 694, which presents a bibliography of metals of the platinum group; and many others. About nine hundred bulletins have appeared since the Survey was organized in 1879.

The investigations of the surface and underground waters of the United States and its possessions are published in a series known as *Water-Supply Papers*. Number 56 in the series deals with methods of stream measurement; number 229, with the disinfection of sewage effluents; number 364 tabulates the water analyses made in the laboratories of the Survey; number 596 gives some very practical notes on methods of water analysis, and so on. About eight hundred water-supply papers have already appeared. Taken together, these publications are a most authoritative source of knowledge regarding the water resources and water problems of the nation.

The laboratories of this branch of the Government service employ twenty-two chemists who are distributed among the grades as follows: one principal chemist; two senior chemists; one chemist; two associate chemists; eight assistant chemists, and eight junior chemists.

Postage Stamps and Chemistry

By Clifford S. Leonard, F.A.I.C.

THE RECENT article by J. N. Taylor, reprinted in THE CHEMIST, together with the data furnished by *Chemical Who's Who*, Vol. II, 1937, on the hobbies of chemists, leads one to suspect that chemists are as susceptible as others to the virus of *philatelitis*. The *Who's Who* reports over six thousand hobby indications of chemists. Of these, stamps account for two hundred and ninety-three, or about five per cent. Philately is exceeded by golf, fishing, gardening, photography, and tennis, but it still stands high. If we may assume that the directory is a fair cross section of chemical personnel, this certainly indicates a fair proportion of innoculation. Of course, this list has a high proportion of executives and does not record many younger chemists, who, perhaps cannot afford golf or the time to go fishing, but may relax evenings with their collection. Perhaps in the whole American Chemical Society philately would stand proportionally higher.

I wonder how many of the chemists realize how things connected

with the chemical industry are depicted on stamps. There is quite a display of raw materials and of a number of chemical industries to be found on stamps. Thus the chemist may be interested in the botanical specimens which provide materials for chemical industry, or which are sources of drugs.

Cotton appears frequently. Cotton and the rayon industry, cotton and nitrocellulose; we begin to think of the chemical interests involved. Cotton appears on stamps of Egypt, Togo, Mozambique, Argentina, Italian Somaliland, and Peru. Maize (corn) appears on stamps of the United States of America, Mozambique, and Liechtenstein. We may think proudly of the number of products the chemist has made from corn. Sugar cane is evident on stamps of British Guiana, Ecuador, Argentina, Cuba, Peru, and Fiji; sugar mills, on issues of Cuba and Salvador. Rubber trees may be seen on stamps of Cameroon and Ceylon. Chicle trees, the source of chewing-gum, are to be seen on a British Honduras issue. Oil palms are evident on many stamps, various French colonies, Togo, Congo, and British Honduras, for example; while palms which produce copra are too abundant in "Stampland" to list here. Cocoa is on issues of Togo, Ecuador, Guadeloupe, Nigeria, and Costa Rica, and we think of cocoa butter, chocolate, and cocoa. Tea plantations are on stamps of Mozambique and Ceylon; coffee on those of Brazil, Mozambique, Costa Rica, Colombia, Haiti, Honduras, Liberia, and Venezuela. Kola trees are on stamps of South West Africa. And even Yerba Maté appears on Paraguayan stamps. Certainly enough caffeine is indicated! Tobacco appears on the United States' Jamestown issue, also on Philippine, Cuban, Ecuadorian, Paraguayan, Tripolitan, and Bulgarian stamps. Thus enough nicotine is represented.

Drug plants? Well, there is the papayana, whence comes papain, on a Tripolitan issue, also *cuphorbia abbysinica*, which yields a cathartic. Balsam of Peru trees are on Salvador stamps (where it grows rather than in Peru, whence comes Balsam of Tolu). Black hellebore is on a Netherlands' stamp. Egypt has branches of *hydnocarpus* in blossom, source of chaulmoogra oil for the treatment of leprosy.

On a United States issue, the Charleston stamp of 1930, appears the indigo plant to remind us of the chemists' conquest of indigo.

The guano birds (gannets) and the guano deposits appear on Peru issues, while the mining of Chilean nitrate is also depicted on a Chile stamp, to remind us of competition with the Tennessee Valley.

Textiles? Besides cotton, there is wool on Argentinian, Australian, Chilean, Falkland Island, Mongolian, Somaliland Protectorate, and New

Zealand issues. Sisal hemp is on a Mozambique Company's stamp.

Industries employing chemists? Saargebiet shows its iron works, blast furnaces, steel works, even a slag pile. A Saar pottery works also appears. Russia shows the metallurgical plant in the Urals, also an iron furnace, and a blast furnace. Paper mills are on Newfoundland stamps.

Considering metallurgy, we may note that placer gold mining is shown on a Colombian stamp, also a prospector on a 1935 issue. South Africa celebrates a gold mine, with gold (?) ink, though the diamond mines are not shown. Perhaps they haven't the ink for it. Alluvial gold mining appears on a British Guiana stamp. Chile (and Peru) show mining of minerals (copper?) as well as the mining of saltpeter. Mining (iron?) appears on a Newfoundland stamp and loading iron ore on another. Dredging for tin is shown on a Nigerian stamp. Oil wells appear on a Colombian Republic issue, while Peru shows an oil refinery. A colliery appears on a Chilean stamp and on a Saar issue. The Trinidad asphalt lake has just made its appearance on a Trinidad and Tobago issue.

Nutrition is well represented with beef cattle, sheep, fish, grains, citrus fruits (oranges, grapefruit, and limes), pineapples, mangoes, apples, strawberries, grapes (the wine industry), bananas, (yes, we have lots of bananas), even pepper (ashanti), and vanilla vines. The codfish is shown (Newfoundland) and the butter industry (New Zealand).

Chemists do not all collect chemical items on stamps, (or even pictures of chemists, of which there are several). At a round table of The Chemists' Club, I know of one stamp collector of ships, one of birds, and one of locomotives. Airplanes, animals, and fishes on stamps are sought for by other chemists of my acquaintance. One AMERICAN INSTITUTE OF CHEMISTS' member, of whom I know, has experimented on the chemical alteration of the colors of postage stamps! Philatelists are still looking for a chemist who will describe a simple and successful way to soak-off stamps colored with fugitive inks or on chalky paper. And by the way, the paper chemist can see almost every type of paper in his stamp collection. The ink chemist can run riot. What shall the colloid chemist collect? Well, he can turn over the stamps and go after gums!

General Motors are featuring a "Highway and Horizons" exhibit at the New York World's Fair. In moving sound-chairs, visitors will tour a vast miniature cross-section of America as it may appear twenty years from now.

Edmund C. Shorey

1865 — 1939

Edmund C. Shorey, Fellow of THE AMERICAN INSTITUTE OF CHEMISTS, passed away, after a considerable period of illness, early Monday morning, January thirtieth, at Emergency Hospital, Washington, D. C.

Dr. Shorey was a native of Canada and was born in Lanark County, Ontario, on March 5, 1865. He secured both his undergraduate and graduate work at Queens University, Kingston, Ontario. The B.A. degree was granted in 1886; the M.A., in 1887 and the D.Sc., in 1896. This institution also honored him with a gold medal in chemistry and a silver medal in natural science.

For the year following his graduation, he was connected with Queens University as a demonstrator in chemistry. From 1888 to 1891, he was engaged in private analytical work and assaying, the time being divided about equally between Kingston, Ontario, and San Francisco, California.

Dr. Shorey entered the field of industrial chemistry when he became chemist for the Kohala Sugar Company of Hawaii. This was not only his first major activity but it was the first time the sugar industry of the Islands employed a chemist to direct production. This experience was supplemented by study at Audubon Park, where Dr. Shorey spent three months investigating cane growing and sugar making in the Louisiana Experiment Station, New Orleans, Louisiana. In 1899, he became chemist of the Territory of Hawaii and served in this capacity until 1903. The transition from industrial chemistry to research in a field that later held his major attention was made by Dr. Shorey when he next became chemist of the Hawaii Agricultural Experiment Station. After four years with this institution, he was transferred to the Division of Fertility Investigations, Bureau of Soils, U. S. Department of Agriculture.

His long association with the Department was only interrupted by a brief return to commercial research when, in 1918 to 1921, he served the National Aniline and Chemical Company as research chemist and devoted the following year in a similar capacity to the Semet Solvay Corporation. He served the Department chiefly with the Division of Soil Fertility Investigations where he attained the rank of senior biochemist. He was also in charge of chemical investigations of the Bureau of Soils for a period of three years. Upon retirement, in

1935, he remained as a collaborator in the Division of Soil Fertility Investigations.

Dr. Shorey's chief interest and activity in chemical research was the biochemical aspect of the organic matter of soils as related to plants. This research is covered by numerous papers and bulletins and the results of this work gained for him international recognition. His intense interest in this field of organic chemistry was maintained until the last, as evidenced by the publication last March of his work upon the isolation and identification of allantoin from several soils. He was known to be engaged in similar work up to early last Fall.

The fund of chemical knowledge acquired in his varied career was always willingly shared with all who approached him. This reflects the outstanding characteristic of Dr. Shorey as a man, namely cheerful helpfulness. He possessed to a marked degree a sense of fairness which was always manifest in dealing with his associates. While it cannot be said that Dr. Shorey rode any of his varied activities to the point of making them a hobby he did maintain a keen interest in the reading of detective stories, fishing, photography, and radio construction.

Dr. Shorey gave very effective advice to the Washington, D. C. Chapter upon problems that confronted the members and it was only because of advancing age that he did not participate personally in the meetings. He maintained an interest in the activities of the INSTITUTE which he joined in 1928. He was also a member of the American Chemical Society; [1] the Association for the Advancement of Science; the Society of Biological Chemists; the Washington Academy of Sciences, and the University Club of Washington, D. C.

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1 Ind. Eng. Chem. News Ed., v. 12, p. 51, 1934.

The Corning Glass, Owens-Illinois, and Pittsburgh Plate Glass Companies will demonstrate through exhibits at the World's Fair, the tremendous scope of the glass industry today. In the section devoted to science, displays of Pyrex brand glass laboratory equipment will be shown. Glass apparatus in the fields of medicine, surgery, and television will also be on display.

COUNCIL

OFFICERS

President, Robert J. Moore
Vice-President, J. W. E. Harrisson
Secretary, Howard S. Neiman
Treasurer, Burke H. Knight

COUNCILORS

Ross A. Baker
Frank G. Breyer
M. L. Crossley
Gustav Egloff
Harry L. Fisher
Neil E. Gordon
W. T. Read
Norman A. Shepard
Maximilian Toch
Lloyd Van Doren
Gerald Wendt

CHAPTER REPRESENTATIVES

New York	*Niagara*	*Philadelphia*	*Washington*
W. D. Turner	A. W. Burwell	Gilbert E. Seil	Henry G. Knight

February Meeting

The one hundred and fifty-ninth meeting of the Council of The American Institute of Chemists was held at The Chemists' Club, 52 East 41st Street, New York, N. Y., on February 16, 1939, at six o'clock, p.m.

President Robert J. Moore presided. The following officers and councilors were present:

Messrs. H. L. Fisher, J. W. E. Harrisson, B. H. Knight, R. J. Moore, H. S. Neiman, N. A. Shepard, G. E. Seil, and W. D. Turner. Mr. M. R. Bhagwat and Miss. V. F. Kimball were present.

The minutes of the previous meeting were approved.

The Treasurer's report, showing a bank balance as of February 14, 1939, of $2,838.25, was read and accepted.

The Secretary reported that the total membership is now 1428.

The Secretary read a letter from Earl R. Harrouff, regarding the economic situation of chemists, and the letter was referred to the Committee on Economic Welfare for its report at the next meeting.

The following new members were elected:

FELLOWS

Adams, J. Richard
(1939), *Associate Chemist,* Bureau of Chemistry and Soils, U. S. Department of Agriculture, Washington, District of Columbia.

Adler, Howard
(1939), *Chief Chemist,* Victor Chemical Works, Chicago Heights, Illinois.

Burger, Alfred
(1939), School of Chemistry, University of Virginia, University, Virginia.

Cole, James W.
(1939), *Teacher,* School of Chemistry, University of Virginia, University, Virginia.

Cook, Roy S.
(1939), Department of Science, Mary Washington College, Fredericksburg, Virginia.

Flugge, S. L.
(1939), *Assistant Manager*, Manufacturing Division, Research Department, Continental Can Company, Chicago, Illinois.

Frank, Henry Frederick
(1939), *Manager*, Metal Decorating Department, Sherwin Williams Company, Cleveland, Ohio.

La Rosa, William V.
(1939), *Chemist*, Rockefeller Institute for Medical Research, 66th Street and York Avenue, New York, N. Y.

Ludwig, Louis E.
(1939), *Chief Chemist*, Devoe and Raynolds Company, Chicago Division, Chicago, Illinois.

Moomaw. W. A.
(1939), *Director of Research*, William P. Poythress and Company, Richmond, Virginia.

Rader, Lewis F., Jr.
(1939), *Assistant Chemist*, Bureau of Chemistry and Soils, U. S. Department of Agriculture, Washington, District of Columbia.

Sherman, Jack
(1939), *Physical Chemist*, Universal Oil Products Company, Riverside, Illinois.

Stiles, Hugh R.
(1939), *In Charge of Biochemical Research*, Commercial Solvents Corporation, Terre Haute, Indiana.

Thomas, Charles L.
(1939), *Associate Director of Research*, Universal Oil Products Company, Riverside, Illinois.

Wallis, Everett S.
(1939), *Associate Professor*, Department of Chemistry, Princeton, N. J.

Whitman, J. Laurence
(1939), *Professor and Head*, Department of Chemistry, Texas Christian University, Fort Worth, Texas.

ASSOCIATES

Allen, Bruce B.
(A.1939), *Post-doctorate Fellow*, Cotton Research Foundation, University of Texas, Austin, Texas.

Calmon, Calvin
(A.1939), *Research Chemist*, The Permutit Company, Birmingham, N. J.

Robinette, Hillary, Jr.
(A.1939), *Junior Research Chemist*, Rohm and Haas Company, Inc., Philadelphia, Penna.

JUNIORS

Bare, Bruce M., Jr.
(J.1939), *Chemist*, Sharples Solvents Corporation, Wyandotte, Michigan.

Boyer, William C.
(J.1939), *Chemist*, Director of Boyer Laboratory, Tulsa, Oklahoma.

The Secretary read a letter from the New York State Civil Service Commission, and upon motion made and seconded the matter was referred to B. H. Knight for report.

A report from the Washington Chapter on Student Medals was read, and upon motion made and seconded, the Council approved the following colleges and universities to receive student medals for 1939: The George Washington University, The American University, University of Maryland, Howard University, The Catholic University of America, Georgetown University, The Johns Hopkins University, and the University of Virginia.

It was announced that an Illinois Chapter of THE AMERICAN INSTITUTE

OF CHEMISTS had been formed in Chicago.

The President announced that a Committee on Legislation and Contracts would be appointed, and referred a contract to that Committee.

Consistent with the new policy of defining Institute Chapters by state boundaries, it was moved and seconded that members would belong to the Chapter in their state, and a portion of their dues would go to that Chapter. If there is no chapter in the state in which a man resides, then a portion of his dues shall go to the Chapter which he elects to attend.

Upon motion made and seconded, Carl Engelhardt was raised from Junior to Fellow.

The following Committee on Arrangements for the Annual Meeting was appointed: Foster D. Snell, Chairman; Raymond E. Kirk, Gerald Wendt, H. S. Neiman, and Robert J. Moore.

The date of the Annual Meeting was set for May 13, 1939.

The following Steering Committee for the Committee on Licensing was appointed: Joseph W. E. Harrisson, Chairman; Foster D. Snell, and Raymond E. Kirk.

M. R. Bhagwat reported for the Chemist Advisory Council.

There being no further business, adjournment was taken.

CHAPTERS

New York

Chairman, Frederick Kenney *Vice-chairman*, Frederick W. Zerban

Secretary-treasurer, D. H. Jackson
17 John Street
New York, N. Y.

Council Representative, W. D. Turner

Pennsylvania

Chairman, George Russell Bancroft *Vice-Chairman*, Walter L. Obold

Secretary-treasurer, Harry C. Winter
The Biochemical Research Foundation
133 South 36th Street
Philadelphia, Penna.

Council Representative, Gilbert E. Seil

October Meeting

The Pennsylvania Chapter opened its 1938-1939 season on October twenty-fifth in the beautiful auditorium of the Jefferson Medical College. Thirty-six members and guests were present.

Dr. George Bancroft presided over the short business meeting which was chiefly concerned with plans for the season. The program committee, Drs. W. L. Obold (Chairman), M. L. Moore, and H. A. Heiligman, invited the members to submit their program suggestions for consideration.

At the conclusion of the business meeting, Dr. W. L. Obold introduced the speaker of the evening, Dr. George Bancroft, who gave a very interesting and instructive discussion of "The Chemistry of Haemoglobin in Its Relation to the Bile Pigments". The speaker discussed the researches of Willstatter and Fischer and showed structural relationships in the Fischer formulae, for haemin, haemoporphyrin, aetioporphyrin, and bilirubin. The degradation of these compounds was also discussed and physical and chemical properties of intermediate compounds described. The lecture was illustrated with lantern slides.

After the discussion of the address, the group assembled in the chemical laboratory to see the demonstrations of blood analyses of a sample taken earlier in the evening. Dr. Bancroft was assisted by Dr. Lorenz Hansen who is also a member of the staff of the Jefferson Medical College.

November Meeting

The November meeting of the Pennsylvania Chapter was held in the Christian Association Building, 36th and Locust Streets, November twenty-second, with an attendance of thirty-one members and guests. At the business meeting following an informal dinner the members voted to adopt the Christian Association Building as the regular meeting place of the Pennsylvania Chapter. The meeting date remains unchanged, the Tuesday following the third Thursday of each month.

Lieutenant William J. Allen, Jr., Plans and Training Officer, 1st Chemical Regiment, Chemical Warfare Reserves, was guest speaker of the evening and addressed the chapter on the very timely subject, "Why Chemical Warfare?".

The old saying that "necessity is the mother of invention" describes the development of weapons of warfare most admirably. From the time man used his fists as his sole weapons to the present high powered rifles and artillery, the introduction of each new weapon has been the result of a need for some means of driving the enemy from his defenses into the open. Each new weapon has resulted in a new scheme of defense that is usually just a little more advanced than the weapon, consequently resulting in a deadlock.

As long as warfare could be kept in the open there was little need for chemicals, but with the development of the elaborate system of trenches and dugouts of the World War, there arose the need of driving the soldiers out of the trenches in order to advance.

The Germans carried out considerable experimental work before launching their first large scale gas shoot on the Ypres salient. A number of chemical compounds were tried with varying results. With some it was found that it was impossible to build up a lethal concentration in the field, while others were found to be too easily protected against. As protection became more effective against all agents, different methods of dissemination were used, and new tactics introduced by both the offense and defense.

The development of a country's chemical industry dictates to what extent that country can plan to use chemicals in any future war. The present state of advancement of the American chemical industry assures us an almost uninterrupted supply of chemical munitions.

Industry will have to be mobilized faster than the army to insure the supply of needed equipment as the training of the troops progresses. In a nation possessing the resources of the

United States, early success in war is insured by sound preparation. The most important form of preparation in time of peace is thorough provision for a war organization. (The opinions expressed in this address were unofficial).

Washington

President, Frank O. Lundstrom

Vice-president, Albin W. Warth *Treasurer,* Joseph J. Stubbs

Secretary, A. P. Bradshaw

2121 New York Avenue, Washington, D. C.

News Reporter to THE CHEMIST, G. P. Walton

Council Representative, Henry G. Knight

Executive Committee

M. S. Anderson	J. H. Hibben	R. M. Mehurin	E. F. Synder
P. R. Dawson	L. N. Markwood	A. R. Merz	E. K. Ventre
R. B. Deemer	N. W. Matthews	H. P. Newton	C. W. Whittaker
H. C. Fuller	J. W. McBurney	W. M. Noble	J. F. Williams
L. R. Heiss	A. L. Mehring	W. H. Ross	P. A. Wright

The Washington, D. C., Chapter held an evening meeting at the Wardman Park Hotel, Friday January 27, 1939, with an attendance of over fifty.

After the meeting was called to order, the members stood for a moment of silent tribute to the memory of Doctor Charles E. Munroe, Honorary President of the Washington Chapter. Announcement was also made at this time of the serious illness of Doctor Edmund C. Shorey, F.A.I.C.

The following committee reports were then made:

Program Committee. Dr. M. S. Anderson announced that there would be a luncheon on February 21st at which Doctor C. A. Browne of the Bureau of Chemistry and Soils would be the guest speaker.

Constitution and By-laws Committee. Mr. R. B. Deemer reported that certain changes had been made in the constitution of the Local Chapter to make it conform with the National Constitution.

Historical Committee. Mr. J. N. Taylor submitted a progress report to the Secretary which stated that although a formal meeting of the committee had not been held, a mass of documents had been obtained from which it was hoped data could be collected and compiled for a complete history of the Chapter.

Membership and Attendance Committee. Dr. J. J. Stubbs reported that the good attendance at the present meeting was evidence of the work of the Attendance Committee. He also read the names and business affiliations of the new members added since September 1938.

Committee on Legislation Pertaining to or Affecting the Chemical Profession. Dr. A. R. Merz reported that the committee had not met but that personal contacts had been made with the other members and that past legislation was being studied.

Student Medal Awards Committee. Mr. F. O. Lundstrom gave the names of the Universities who gave Medal Awards last June and the names of the students receiving them.

Publicity Committee. Dr. J. McLaren reported that notices of the meeting had been sent to the local newspapers, that announcements had been made at other scientific meetings, and that bulletins had been posted in various laboratories throughout the city.

Local Committee on Unemployment (sub-committee to work with the Chemists Advisory Council). Mr. J. F. Williams reported that the committee had not met. He read a letter from the Chemist Advisory Council to the effect that they were holding a meeting in January to plan their activities for 1939.

The speaker of the evening was Doctor H. G. Knight, chief of the Bureau of Chemistry and Soils. His subject, "The Composition of the Chemist", which caused considerable talk and speculation before the meeting, was interpreted in an unusually interesting manner by Doctor Knight. In his concluding paragraph he stressed the points which he had made in his paper. "It would be wrong for me to leave the impression that I think I have devised a yardstick that will make it easy to put each man in the right yard. What I have said has been said in all humility. I do believe that the several things I have emphasized are highly desirable, but there are chemists practicing their profession today who are proving that a man can sometimes go a long way on a wooden leg—if he keeps it well oiled. On the other hand, there may be additional desirable components in the chemist that other men would like to see in the list. It pleases me to lay stress on imagination and realism, on broad fundamental education, varied experience, foreign languages, succinct English, a good code of ethics. It wouldn't please me to drop any of them. There they are, you may add your own seasoning."

Dr. Knight's paper appears in this issue of THE CHEMIST.

Niagara

Chairman, William R. Sheridan *Vice-chairman,* Maurice C. Taylor

Secretary-treasurer, Carl H. Rasch
1212 Oliver Street
North Tonawanda, N. Y.

News Reporter to THE CHEMIST, George W. Fiero

Council Representative, Arthur W. Burwell

Sir Richard Gregory delivered the Elihu Root lecture at the Carnegie Institution of Washington, D. C., on December eighth, on the subject of "The Cultural Contacts of Science". According to *Chemistry and Industry, (London)*, delegates from the American Association for the Advancement of Science were present, at the annual meeting of the British Association at Cambridge, to promote coöperation of the main interests of the two organizations, with particular regard to social and international relationships. A new Division of the British Association was established with these objects in view, and Sir Richard Gregory was appointed chairman of the Division, which will concern itself with social problems arising from the impact of science upon modern life.

NORTHERN LIGHTS

By Howard W. Post, F.A.I.C.

To those of our readers who are interested in studying the behavior of polyhydroxy aliphatic compounds, we would recommend an interesting article by Munro and Pearce in *The Canadian Journal of Research* **16B** 390 (1938). The authors report that alcohols of the general type $C_nH_{n+2}(OH)_n$ lengthen the time of setting of silica gels, this increase being augmented by an increase in the value of "n". These influences, however, are considerably modified by hydrogen ion concentration.

The twenty-second Canadian Chemical Convention is scheduled for June fifth to eighth of this year at London, Ontario. A new section, that of Metallurgy and Mining, will be inaugurated.

The American Newfoundland Fluorspar Company is planning to commence operations this year.

Speaking of natural resources, George M. Wrong in his book entitled *The Canadians* credits Canada with "half the fresh water of the globe" including, of course, the lakes on the frontier; with third place as gold producing country of the world; with more than thirty-billion tons of coal deposits, chiefly in Nova Scotia, British Columbia, and Alberta; and with large deposits of silver, nickel, and other metals.

"Canada is a comparatively great chemical manufacturing, importing, and exporting country with a promising future. Using the last available annual statistics, the value of strictly chemical products manufactured was in the order of thirty-six million dollars, with exports nearly fourteen million and imports nineteen million. Chemical and allied products, valued at plants of manufacturers, totalled one hundred forty-five million dollars."—*Victor Bartram, Esq., President, Society of Chemical Industry.*

Sir Frederick Gowland Hopkins will retire next year from the professorship of biochemistry at Cambridge University, an appointment he has held since 1914, according to *The Chemical Trade Journal and Chemical Engineer* (*London*).

The University of Sydney, Australia, plans the erection of a new building to house the Chemical Institute of that University, to cost about 100,000 pounds.

Foster Dee Snell, F.A.I.C., addressed the Dayton Section of the American Chemical Society on January 10, 1939, and the Toledo Section of the American Chemical Society on January 11, 1939. His subject was "Some Factors in Detergency". Dr. Snell outlined the four known factors, which so far as known control the efficiency of a detergent, and showed their application in many types such as toilet soaps, laundry detergents, scrub soaps, sulfated alcohols, metal cleaning, etc.

(Those of our members who are interested in the licensing of Chemists will find the following regulations worthy of consideration.)

Regulations for the Profession of Chemist

Translated from the Brazilian *Revista De Chimica Industrial*
March 1935
by
Technical Department
E. J. Lavino and Company

Decree No. 57 February 20, 1935

Approval of regulations for the execution of Decree No. 24,693 of July 12, 1934, which treats with the practice of the profession of Chemist.

The President of the United States of Brazil, using the power conferred upon him by Act 56 No. 1 of the Constitution, hereby approves the regulations herein contained, and assigns to the Minister of Works, Industry and Commerce the execution of Decree No. 24,693 of July 12, 1934, which treats with the practice of the profession of Chemist.

Getulio Vargas
Agamemnon Magalhães

REGULATIONS WHICH REFER TO DECREE NO. 57 OF FEBRUARY 20, 1935

Chapter I

The Chemical Profession

ART. 1. The free right to exercise the profession of Chemist in all the territories of the Republic, observing the conditions of technical capacity and other requirements of these regulations, is granted to:

(A) All persons holding Chemical, Industrial Chemical, Agricultural Chemical or Chemical Engineering diplomas from a State or officially recognized school in Brazil.

(B) All persons holding diplomas in Chemistry from foreign institutes of higher learning, who have validated their diplomas prior to July 14, 1934.

(C) All persons exercising, publicly or privately, a function requiring the qualifications of Chemist at the time of the publication of Decree No. 24,693 of July 12, 1934, are required to register as described in Art. 2 of these regulations before July 14, 1935.

(1) Those persons included in group (C) of this article will receive the title of *"licensee"*.

(2) The free right to exercise the profession under Art. 1 will be granted to qualified foreigners.

. . . . .

(3) The right to exercise the profession of Chemist by naturalized Brazilians is subject to the record of military service in Brazil.

(4) The right to validate diplomas from foreign institutions of higher learning shall be granted only to native Brazilians.

Chapter II

The Professional License and the Registration of Chemical Diplomas

ART. 2. All persons who practice, or pretend to practice, the functions of Chemist, and obliged to hold the professional license prescribed by the Minister of Work, Industry and Commerce; all persons coming within the classifications (A) and (B) of Art. 1, must register their diplomas in accordance with and as provided by Decree No. 24,693 of July 12, 1934.

(1) In order to acquire a professional license for the practice of the profession of Chemist according to the provisions of Decree No. 22,033 of October 29, 1932, the applicant must present proof that

(a) He is a citizen of Brazil, either native or naturalized, or a foreigner residing in Brazil.

(b) If a Brazilian, he must have full civil and political rights.

(c) He holds a diploma in Chemistry, Industrial Chemistry, Agricultural Chemistry or Chemical Engineering from a State school or an officially sanctioned school.

(d) If he holds a diploma from a foreign institute of learning, he must have his diploma validated in accordance with the provisions of the law.

(e) If a naturalized citizen of Brazil, he must have a satisfactory record of military service in Brazil.

(f) A foreigner who has been legitimately practicing the profession of Chemist since the promulgation of the Constitution of 1934, may submit in his favor, evidence of international reciprocity for the recognition of diplomas.

(2) To the requirements of the above are added:

(a) The diploma shall be authenticated in accordance with requirement (b) of the preceding article, by the recognized signature of the Secretary of Foreign Relations on the respective certificates.

(b) The applicant must submit proof that at the time of the publication of Decree No. 24,693 of July 12, 1934, he was publicly or privately engaged in work for which it is necessary to have a Chemist's qualifications, said proof to be authenticated by a Regional Inspector of Works Department, or by a Federal Collector, when working in the capitals of states or in interior municipalities.

(c) The applicant shall submit three photographs as required by Art. 5.

(3) The documents required by (2) and (3) may be filed at any registration office, and applications for professional licenses or permits must thereafter be directed to the same office.

(4) After approval of the validity of the documents presented, the Bureau of Professional Licensing will register same in the proper record books. The documents referred to in paragraph (1), (c), together with the professional license granted, will be returned to the applicant from the office at which they were filed, within the time limit established in paragraph (5) Art. 4 of Decree No. 22,033 of October 29, 1932.

(5) The applicant will be notified of any questions concerning the papers filed, and the time specified in the preceding paragraph will begin as of the date on which the verifications are made.

ART. 3. The registration of diplomas is subject to a fixed tax of 30$000, in addition to the fees fixed by Decree No. 22,033 of October 29, 1932.

ART. 4. In the registration of diplomas, only certificates of diplomas, letters, testaments and other documents which are properly signed, and the signatures of which are notarized will be accepted. Papers dealing with foreign diplomas must be signed by the Secretary of Foreign Relations, and each paper must have attached its respective translation made by a commercial Brazilian interpreter.

(1) The National Department of Works and the Office of the Inspectors of the Minister of Works, Industry and Commerce in the States will periodically publish the list of Chemists.

ART. 5. As documentary evidence

of registration, The National Department of Works will furnish each applicant with a numbered professional license, to which is attached a photograph, 3 x 4 centimeters, full face with head uncovered and finger prints, and in addition the following:

(a) Name in full.

(b) Nationality. (If a foreigner reasons for not being naturalized).

(c) Date and place of birth.

(d) The name of school attended.

(e) Date the diploma was granted and registration number in the Ministry of Works, Industry and Commerce.

(f) The date the diploma was validated if from a foreign school.

(g) Other titles or qualifications.

(h) Signature of applicant.

(1) The license granted under Art. 1, paragraph 1 will contain instead of (d), (e) and (f) of this article, the date of nomination and admission to office if the applicant was engaged in a public capacity; or a certificate relative to his work including the date at which it started if engaged in private enterprise.

ART. 6. The license required in accordance with these regulations to exercise the profession of Chemist supersedes the diploma or title as a paper of identification and shall be presented on demand to Federal, State or Municipal authorities as required for the assignment of contracts, the occupancy of public office or the discharge of any function inherent to the Chemical profession.

ART. 7. No person shall accept fees for services concerned with the practice of the profession of Chemist unless he can produce evidence of registration in accordance with these regulations, and this evidence of registration will be required for the performance of all official acts requiring the technical qualifications of Chemist.

ART. 8. All persons offering through any advertising media their services as Chemists without being properly registered are subject to the fines applicable to the illegal practice of the profession.

CHAPTED III

The Practice of the Chemical Profession

ART. 9. No person can legally practice the profession of Chemist without satisfying the conditions of Chapter 2, Art. 2.

ART. 10. The practice of Chemical profession comprises:

(a) The manufacture of all diversified stages of industrial products and by-products.

(b) The execution of opinions, certificates and special projects in Chemistry and the management and responsibility of laboratories of the chemical departments of industrial and commercial enterprises.

(c) A professorship or chair in Chemistry in courses of higher Chemistry.

(d) Chemical engineering.

(1) The activities listed in (a), (b) and (c) of this article are granted to Chemists, Industrial Chemists and Agricultural Chemists as described in Art. 1, (A) and (B).

(2) Art. 1, (A) and (B) includes graduates in Medicine and Pharmacy. The activities of this group are defined in Art. 2, (d), (e) and (f) of Decree No. 20,377 of September 8, 1931. The activities of Agricultural Chemists and Agricultural Engineers are specified in Art. 6, (h) of Decree No. 23,196, October 12, 1933.

ART. 11. The performance of public duties for which the qualifications of Chemist are required are listed in Art. 10, paragraph 2 of Decree 24,693, July 12, 1934 and the performance of such duties require that the applicant

has previously satisfied Art. 9 of these regulations.

Art. 12. Public confidence in the certificates of analyses, opinions and projects is established by causing the applicants to satisfy the conditions outlined in Art. 1, (A) and (B).

Art. 13. A professor of chemistry shall satisfy the conditions of Art. 1, (A) and (B), if teaching special subjects in schools of higher learning either State or officially recognized.

Art. 14. The name of the Chemist responsible for the laboratory or for the manufacture of the products of an industrial concern shall appear on all papers and transactions of said concern.

Art. 15. Only Chemists qualified according to Art. 1, (A) and (B) can be named ex-officio for the examinations of laboratories, plants and products made therein.

(1) This article does not apply to laboratories or products of pharmaceutical manufacturers.

Art. 16. Chemists qualified in accordance with Art. 1, (A) and (B) are permitted to execute all services not specified in these regulations which require, because of their nature, a knowledge of Chemistry.

Chapter IV
Inspections

Art. 17. The regulations of the practice of the profession of Chemist are incumbent upon the National Department of Works, and upon the Offices of Regional Inspectors of the Ministry of Works, Industry and Commerce in the various States.

Art. 18. Duties of the inspecting officers.

(a) To examine the documents required by the Board of Registration in accordance with Art. 1, 2, and 3, and to suspend licenses and to prosecute those who have not satisfied the requirements of these regulations.

(b) To register all communications and contracts to which Art. 26 refers.

(c) To enforce strict adherence to the provisions of these regulations, making whatever investigations are necessary, such as examining the archives, accounting books, payrolls, contracts and other documents used by firms or commercial or industrial enterprises who employ the services of persons having duties which require the qualifications of a Chemist.

Art. 19. Groups of Chemists duly recognized shall be appointed to aid in the inspections necessary to enforce the observance of Art. 18, (c) in accordance with Decree No. 22,300 of January 4, 1933.

Chapter V
Penalties

Art. 20. The Minister of Work, Industry and Commerce will declare invalid diplomas, testaments, certificates or other documents containing any infraction of these regulations and the authors and accomplices of such infractions will incur the penalties established in the law.

(1) Any falsification of diplomas or other documents must be reported immediately to the Registrar for Professional Licensing of the Ministry of Works, Industry and Commerce, submitting the falsified documents to institute proceedings in the case.

Art. 21. In addition to the penalties provided, any Chemist or licensee violating the following rules shall have his license suspended.

(a) No Chemist shall be guilty of professional carelessness, give false testament, counterfeit professional stamps or promote falsification relative to the practice of the profession as outlined in these regulations.

(b) No Chemist shall use scientific knowledge in the practice of crime or in attempts against the State, the social

order or the public health.

(c) No Chemist having a foreign diploma shall neglect to register or validate said diploma with the Registrar for Professional Licensing in the Ministry of Work, Industry and Commerce.

(1) The penalty for violation of the above will vary from one month to one year after regular prosecution in a public court of justice at the discretion of the National Department of Works.

ART. 22. Any person practicing the profession of Chemist without fulfilling the requirements of Art. 1, or without being registered according to the requirements of Art. 2, is subject to a fine of 200$000 to 5:000$000, and the fine shall be doubled on the second offense.

(1) Disregard of the provisions of Decree No. 24,693 of July 12, 1934 and of these regulations by firms or enterprises knowingly requiring the services of a Chemist will be punished by the maximum fine.

(2) The fines will be imposed in the Federal Districts by the National Department of Works, and in the rural districts by the Offices of Regional Inspectors.

ART. 23. The requirements of the licensees described in Art. 1, paragraph 1, can be suspended by the National Department of Work subject to the approval of the Minister, upon proven testimony that the infractions enumerated in Art. 21 interfere with a public or private function being performed by the licensees prior to the publication of Decree No. 24,693 of July 12, 1934.

Chapter VI

General and Transient Arrangements

ART. 24. The number of foreign Chemists employed in any enterprise or by any company cannot exceed 1/3 of the number of Brazilian Chemists on the total staff.

ART. 25. The decisions, the collection of fines, and the distribution of the resources shall be in accordance with provisions of Decree No. 22,131 of November 23, 1932.

ART. 26. A Chemist upon assuming technical direction or charge of a manufacturing plant or an industrial analytical laboratory, shall, within 24 hours, communicate this fact in writing to the fiscal organ, assuming from that date the technical responsibilities for the product manufactured.

(1) A signed contract between the Chemist and the manufacturer should be presented within thirty days to the fiscal organ.

(2) A communication similar to the one described in paragraph 1 of this article, should be made by the Chemist when severing his connections with a manufacturer. In case of failure on the part of the Chemist, the communication should be made by the manufacturer.

ART. 27. The validation of diplomas in accordance with Art. 1, (A), shall be checked and verified with each registration in the Ministry of Work, Industry and Commerce.

ART. 28. All graduates in Chemistry who, at the time of publication of Decree No. 24,693 of July 12, 1934, are exercising the rights of the profession of Chemist in public or private establistments are required to register in compliance with Art. 2 with these regulations before July 13, 1935.

ART. 29. Applications for registration addressed to the Minister of Works, Industry and Commerce should be sent by a competent carrier in the Capital or in the States according to the place of residence of the applicant.

ART. 30. Interpretation of these regulations, arising from doubts or omissions, will be made by the Minister of Work, Industry and Commerce.

EMPLOYMENT

Chemists Available

CHEMISTRY PROFESSOR, F.A.I.C. Ph.D. from leading Eastern University, seeks permanent teaching position in a university or college, preferably with opportunity for research. Major field organic; has also taught inorganic and analytical; independent research. Eleven years teaching, four years industrial experience; now teaching. Location immaterial. Please reply to Box 25, THE CHEMIST.

CHEMICAL ENGINEER, F.A.I.C., Age 33. Wants to organize and operate a trouble-shooting and operations development department in a medium-sized manufacturing plant. Varied experience with Bureau of Standards, Du Pont, and others qualified me for this work in many fields. Please reply to Box 111, THE CHEMIST.

BIOCHEMIST, PH.D., M.D., F.A.I.C. American citizen. 20 years' research experience (Germany, U. S. A., South America). Affiliated with South American leading society. Valuable connections in South American government circles. Languages. Thorough knowledge of South American markets and expansion possibilities of United States interests. Country most familiar with: Chile. (Argentina.) Seeks position with American firm here or in South American country. Please reply to Box 121, THE CHEMIST.

CHEMIST-BACTERIOLOGIST, A. A. I. C. Analytical, research development. Pulp, paper and by-products; distilled alcoholic beverages; dairy products; brewery; soap, pharmaceuticals, and cosmetics; general food investigations. Please reply to Box 101, THE CHEMIST.

HUNGARIAN CHEMIST, 26. Ph.D. Edinburgh, Scotland. Diplom Ingenieur Chemiker, Technische Hochschule, Zurich, Switzerland. Fluent English, German, good French, Italian, Spanish. Reads Swedish, Norwegian. Two and one-half years with pharmaceutical firm of world repute. Medicaments, hormones, vitamins. Abstractor *British Chemical and Physical Abstracts.* Teaching. Organizing experience. Seeks post as research or works chemist, abstractor or translator. Salary by agreement. Please reply to Box 21, THE CHEMIST.

YOUNG WOMAN. College. Chemistry, business, and secretarial. Invaluable assistant to chemical executive. Routine laboratory, stenographic and reference work. New York area. Please reply to Box 23, THE CHEMIST.

INDUSTRIAL CHEMIST, F.A.I.C., Harvard Graduate; age 36. Ten years' plant and laboratory experience. Pulp, paper, paper board mills; cellulose plastics; mineral pigments; dyes; starches, resins and waxes. Available immediately. Please reply to Box 103, THE CHEMIST.

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Positions Offered

CHEMISTS. PH.D. degrees, young, organic or inorganic background.

CHEMIST who knows production and cultivation of plants, especially by the soilless growth method, for organic research on plants.

YOUNG CHEMIST, experienced in nonferrous metal analyses. Salary $1800.00.

CHEMIST who can handle research and production of toilet soaps.

CHEMIST for research and production of phenyl-formaldehyde and thermosetting resins. Salary $2800.00.

CHEMIST who has had experience in the production of breakfast cereals.

For the above positions, please write to box 32, THE CHEMIST.

PHARMACEUTICAL CHEMIST for analytical control laboratory. Recent graduate, with degree in Pharmacy. Experience not necessary. Please reply to Box 34, The CHEMIST.

United States Civil Service Examinations (Unassembled)

SENIOR PHARMACOLOGIST, $4600 a year.

PHARMACOLOGIST, $3800 a year.

ASSOCIATE PHARMACOLOGIST, $3200 a year.

ASSISTANT PHARMACOLOGIST, $2600 a year.

Bureau of Chemistry and Soils and Food and Drug Administration, Department of Agriculture.

Applications must be on file with the United States Civil Service Commission at Washington, D. C., not later than the following dates:

(a) March 27, 1939, if received from States other than those named in (b) below.

(b) March 30, 1939, if received from the following States: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

Information and application forms may be obtained from the U. S. Civil Service Commission, Washington, D.C. or from any first class Post Office.

BOOKS

VORSCHRIFTEN ZUR DARSTELLUNG CHEMISCH-PHARMAZEUTISCHER UND PHYTOCHEMISCHER PRÄPARATE. By Professor C. A. Rojahn. Published by *Deutscher Apotheker-Verlag*. Dr. Hans Hösel, Berlin W. 15, Germany. 3 Volumes.

This publication is concerned with the production of chemical-pharmaceutical and phytochemical preparations. Volume I is devoted to inorganic chemical preparations; volume II, to organic chemical preparations, and volume III, to phytochemical preparations. Each one of these books contains from one-hundred and twenty to two-hundred and forty exact formulas and prescriptions showing how to produce complicated preparations which might be too expensive for schools or pharmaceutical laboratories to purchase in small quantities.

ANGEWANDTE PHARMAZIE. By Dr. Ing. W. Kern. 331 pp. Second Edition. Publisher as above.

Besides many formulas, prescriptions, methods of physiological investigations, etc., this book contains one

hundred and sixty-three fine pictures of modern laboratory apparatus, instruments, etc.

PHARMAKOLOGIE FÜR PHARMAZEUTEN. By Dr. Hermann Führer. Publisher as above.

This book is written especially for German students of the German Pharmacopoeia.

LEHRBUCH DER PHARMAKOGNOSIE. By Professor R. Jaretzky. 383 pages. Publisher as above.

This volume is written for the same purpose as Führer's book listed above, and therefore, seems to be of no great interest to practitioners outside of Germany.—RUDOLF SEIDEN.

PHYSICAL ASPECTS OF ORGANIC CHEMISTRY, by Waters and Lowry, 1937. *D. Van Nostrand Company*, New York, N. Y. 501 pp. Price, $7.50.

Here is a book that can be read with profit by all chemists and especially by those teaching physical and organic chemistry. Dr. Waters and the late Professor Lowry have done an excellent job in showing how the methods and theories of the physical chemist and the physicist may be used with advantage to answer many of the problems arising in organic chemistry. The book should be a great aid in clarifying in the minds of many just why certain physical measurements are made and how those measurements may be best utilized.

The book is up-to-date on the concepts of physical, organic, and inorganic chemistry. Most of the chapters begin with a brief history of the subject at hand and lead quickly up to the modern day theory. In showing the application of the various theories of physical chemistry to organic problems, the authors must be commended upon their free use of illustrative examples which for the most part have been judiciously chosen.

In some cases, one develops the opinion that the authors could have amplified certain of the material to advantage. In all such cases it is soon realized that the biggest problem in writing such a book is to keep it within the narrow confines of one volume and at the same time to keep it lucid. This the authors have done admirably. Those wishing to go more thoroughly into any of the subjects discussed will find the book quite complete with references.

The subjects discussed in chapter order include: I. Chemical Affinity, II. Physical Theories of Molecular Structure, III. Valency, IV. Electrical Dipoles, V. Chemical Reactivity, VI. Unsaturation, VII. Free Radicals and Their Non-Ionic Reactions, VIII. Ionization and Ionic Reactions, IX. Acidity, X. The Reactivity of Halogen Compounds, XI. General Polarity, XII. Hydrolysis and Esterification, XIII. Ionotropic Change, XIV. Molecular Rearrangement, XV. Conjugation, XVI. Aromatic Compounds-I, XVII. Aromatic Compounds-II. Index of Authors, Subject Index.

Chapter V., in the reviewer's opinion, was the weakest. Much more could be done with this subject with regard to the application of kinetics to the mechanism of organic reactions. However, the important theories and concepts are taken up. Chapters I, II, III, IV, VII, VIII, IX, XII, and XIII are especially good.

—CHARLES E. WARING

Plan to attend THE AMERICAN INSTITUTE OF CHEMISTS' *meeting at the World's Fair, New York, May* 13, 1939.

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